BRIDGE
SAUDI COMPANY LTD.

TECHNICAL PROPOSAL

Client:	**S-Chem**
Job Reference:	**REQ 25001144**
Our Reference:	**BSC/MOJ/ISD – 0990**
Scope of Work:	**Furnace Convection Tube Cleaning**
Date:	**6 April 2023**

CRYSTAL DUST®

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BRIDGE SAUDI COMPANY LTD.	**SUBJECT: REQ 2500114 - COMMERICIAL- PROPOSAL FOR OFF-LINE FURNACE CONVECTION SECTION CLEANING USING CRYSTAL DUST® AT SAUDI CHEVRON**
	Our Ref: BSC/MOJ/ISD – 0990 Dated: 06.04.2023

Dear Mr. Zaidi,

We thank you for inviting us to bid for the subject works and are pleased to submit our technical proposal based on our site visit, the bid documents received from you, and our previous knowledge of the equipment.

1. Introducing Bridge Saudi's exclusive partner TSOL Projects:

1.1 TSOL specializes in developing effective solutions to performance challenges in industrial process plants, and is Bridge Saudi's exclusive technical partner for industrial cleaning.

1.2 TSOL developed the crystal cleaning technique initially for air cooler heat exchangers, and later for furnace convection coils.

1.3 They develop their own proprietary high-performance dry cleaning machines and crystal cleaning media that allow us to clean Safer, Faster, Better.

1.4 Their latest media, *Crystal Dust 3.5,* is more effective than other dry powder medias as the larger micro-collisions increase the cleaning and polishing effects, thereby delivering better cleaning results.

2. Scope of Work

2.1 Mobilisation/demobilisation from/to S-Chem

2.2 External tube cleaning of F3301 steam superheater convection coils using *Crystal Dust* technique

2.3 External tube cleaning of F3201 alkylaytor reboiler convection coils using *Crystal Dust* technique

3. Unit Descriptions

3.1 The F3201 convection section has a total of 9 tube rows, with 8 tubes per row, and a uniform tube length of 5.88 meters. The tubes are grouped into 2 separate banks with a void in between, which has a height of approximately 90cm. The elevation of bottom row of bare tubes is 23.9 meters, and the elevation of the top manway is approximately 29 meters. F3201 has a side access door allowing personnel to access.

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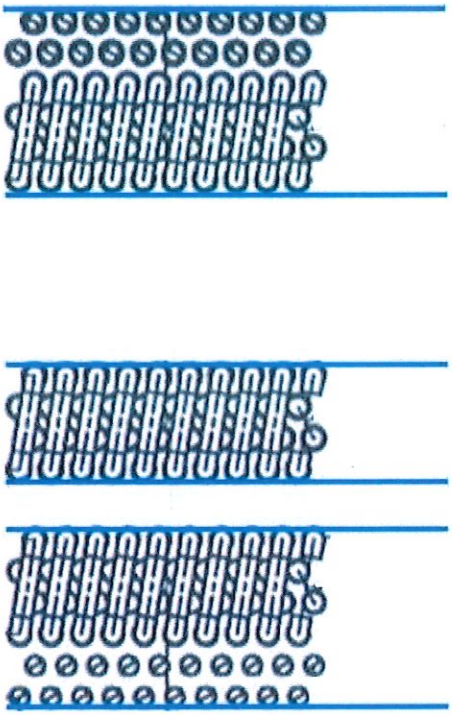
3.2 The F3301 convection section has a total of 16 tube rows, with 10 tubes per row, and a uniform tube length of 18.29 meters. The tubes are grouped into 3 separate bundles with voids (spaces) in between. The elevation of the bottom row of bare tubes is approximately 17 meters, and the elevation of the two top manways is approximately 23.5 meters. F3301 has no side manway, so personnel access is only from the upper manways and from below through the firebox.

3.3 The tube layout in F3301 can be illustrated in the following diagram:



Upper bank (height 1150 cm):
6 rows of finned tubes

Void (height 120cm)

Middle bank (height 900 cm):
4 rows of finned tubes

Void (height 50 cm)

Lower bank (height 1150 cm):
4 rows of finned tubes
2 rows of bare tubes at bottom

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4. Explanation of Technique

4.1 *Crystal Dust* is a completely dry cleaning method that was specifically developed by our European partner TSOL for cleaning bundles of finned tubes.

4.2 The cleaning process is as follows:

4.2.1 Fluidized mineral crystals are injected by compressed air at 8 bar into furnace convection banks.

4.2.2 The crystal flows into all spaces, which means it flows around the complete circumference of tubes, as well as in between the fins.

4.2.3 An infinite number of impacts occur when the friable crystal impact finned tubes.

4.2.4 These collisions lift the fouling away from the tube and fin surface, and causes crystals and fouling to become pulverized.

4.2.5 The force of the compressed air pushes all crystal and fouling out the opposite side of the bundle.

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5. Execution Overview

5.1 Equipment is positioned at the base of the furnace.

5.2 Hoses are lined up to the appropriate convection manway.

5.3 Cleaning operators wear single-line breathing apparatus and helmet torch.

5.4 Only one operator is inside the confined space during cleaning.

5.5 For F3301, we can only directly clean the upper and lower banks; the middle bank will be partially cleaned when cleaning the upper and lower banks.

5.6 To ensure F3301's middle bank is properly cleaned, an insertion nozzle is used.

5.7 In F3201, both banks can be cleaned from above and below, so there is no need to use insertion nozzles.

5.8 Pulverized fouling particles will be lifted up by the draft, and exit at the stack, whereas heavier particles will fall down.

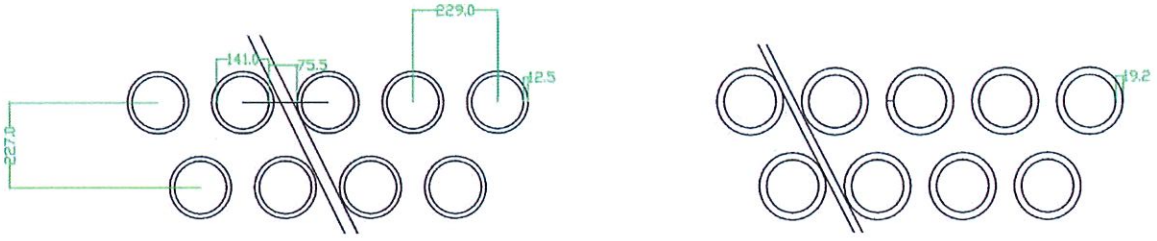
5.9 After cleaning, the convection banks are air blown and the radiant floor is vacuumed by a portable industrial vacuum unit.

6. Insertion Nozzle

6.1 To ensure the inaccessible middle bank is cleaned to the same standard as the lower and upper banks, we use a custom-designed insertion nozzle.

6.2 This nozzle is inserted through the upper and lower banks to deliver crystal at maximum pressure and at a wider spread so as to cover as much lateral distance as possible, thereby ensuring complete coverage.

6.3 By modelling F3301 tube layout, we have calculated the optimum nozzle size to fit between the upper and lower banks:



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7. Qualifications

7.1 Expected duration is:

- 7.1.1 2-shifts for set up (day shift only)
- 7.1.2 8-shifts for cleaning F3301 (day and night shifts)
- 7.1.3 4-shifts for cleaning F3201 (day and night shifts)
- 7.1.4 1-shift for vacuuming and tidy-up (day shift)

7.2 The furnace is fuel gas fired and the fouling will be non-bonded or lightly bonded.

7.3 If the fouling turns out to be bonded to the finned tubes more than expected, it may take extra time which is chargeable at stand-by rates.

7.4 Any unused cleaning media remaining at the end of the job will remain the property of contractor.

8. Client to Provide (free of charge):

8.1 Plant ID's, gate passes, site access for our driver and vehicles.

8.2 Equipment lay down area.

8.3 Refilling of diesel in air compressors each day

8.4 5T Forklift for Unloading / Loading, and transporting our equipment at site.

8.5 Site coordination, arranging permits, work permit receiver, as required.

8.6 Plant utilities like sewer system, internal/external lightings etc., as required.

8.7 Access to site facilities, such as rest area, toilet, and clean drinking water.

8.8 Scaffolding, as required.

8.9 Closure of all furnace openings below convection section, as required.

8.10 Running blowers/fans during cleaning, as required.

8.11 Area lighting at the base of the unit for our manpower to operate the machine, if cleaning conducted at night.

8.12 Any electrical safety equipment required by Client (such as GFCI).

8.13 Any other items required that have not been advised prior to preparing this proposal.

8.14 Disposal of waste.

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9. Bridge Will Provide/Take Care:

9.1 Mobilization and de-mobilization to S-CHEM Site Al-Jubail.
9.2 Submit all required documents for preparing ID's for manpower and vehicle stickers.
9.3 Provide Method of Statement inclusive of Job Safety Analysis [JSA], Plot plan, Schematic drawing for client review and approval after award of contract.
9.4 Provide required equipment for Furnace cleaning works.
9.5 Provide technical supervision crew for cleaning works.
9.6 Required Chemistry for cleaning works.
9.7 Food, Accommodation and Transport for our crew.
9.8 Necessary PPE required for our crew.
9.9 Provide Safety shower and eye wash stations.
9.10 Provision of permit receiver and safety officer
9.11 Provision of single line BA if required
9.12 Provision of Dry Super Sucker
9.13 Transportation of dry debris/fouling to approved dumping facility
9.14 Submit a final dossier / report after job completion.

10. Attachments:

10.1 RFQ Check List
10.2 Scope of Work Compliance
10.3 Schedule
10.4 Manpower Loading Chart/List
10.5 Equipment Loading Chart/List
10.6 Method of statement
10.7 Relevant Work Experience
10.8 QA/QC Plan
10.9 Project Organization Chart
10.10 Safety Statistics
10.11 Subcontracting Plan.

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We trust the above is in-line with your requirements and look forward to receiving your further instructions.

Yours sincerely,

Jonathan Brookes
TSOL JV Manager
Bridge Saudi Company

شركة بريدج السعودية المحدودة
ESTIMATION
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Form No. 12: RFQ Checklist form

S-Chem	RFQ CHECK LIST	No. - 12

CONTRACTORS are required to review the below list and the requirement listed.

Please ensure to submit the requested documents along with the Technical Bid Packages, to avoid dis-qualification

SN	Document Details	Required (Y/N)	Submitted (Y/N)	Remarks (if any)
1	Scope of Work Compliance	Y	Y	Along with Responsibility Matrix
2	Schedule	Y	Y	
3	Manpower Loading Chart	Y	Y	
4	Equipment Loading Chart	Y	Y	
5	Method Statement	Y	Y	
6	Relevant Work Experience (with S-Chem and Outside with project/job details, client contacts etc..)	Y	Y	
7	QA / QC Plan	Y	Y	
8	Organization Chart	Y	Y	
9	Safety Statistics (last 03 years)	Y	Y	
10	Sub-Contracting Plan (if any)	Y	Y	

EXHIBIT – I
SCOPE OF WORK

1.0 DESCRIPTION OF WORK – GENERAL

Except as otherwise expressly provided elsewhere in this Contract, CONTRACTOR shall provide all labor, supervision, material, equipment and inspection, prepare record books, furnish all materials, transportation, freight forwarding, customs clearance, material receiving and handling, warehousing services, utilities, supplies, tools, construction equipment, temporary facilities and each and every item of expense necessary for the **"Furnaces F-3301 and F-3201, Convection Section Steam Super Heater Fin Tubes Dry Blasting and Cleaning for JCP EBSM during JCP TA2024"** at the COMPANY facility in Jubail Industrial City.

1.1 CONTRACTOR:

The Scope of work described in this document shall be executed in accordance with the following terms and conditions:

CONTRACTOR's responsibilities include, but are not limited to the following:

1.1.1 CONTRACTOR shall perform safe and timely execution of all work activities described in" CONTRACTOR's Scope".

1.1.2 Work performed by CONTRACTOR will be under the direction of COMPANY supervision. As necessary, additional support or direction can be obtained from the Area Supervisor-in-charge assigned by COMPANY.

1.1.3 Providing a detailed Turn-Around (T.A.) schedule showing start date, detailed sequence of activities, end date, crew sizes and craft mix. All work is to be planned and scheduled to complete as soon as possible.

1.1.4 Arranging receipt and transfer of all non-consumable material from COMPANY designated area to the work location. CONTRACTOR will return the balance of unused and undamaged material to COMPANY designated area after completion of work.

1.1.5 Supplying all qualified labor, supervision, tools, equipment, Dry Vacuum Trucks, hoses, connections, manifolds, pumps, technical support, consumables, expendables, and temporary supplies necessary for, and reasonably incidental to complete mentioned SOW (Scope of Work).

1.1.6 CONTRACTOR to provide adequate number of Dry vacuum trucks, hoses, connections and manifolds to vacuum dust generated during blasting and cleaning of Convection section fin tube of F-3201 and F-3301.

1.1.7 Dry Vacuum truck all hoses must perform the continuity test and have tags placed on it before mobilization which will be inspected by COMPANY when they arrive at site. CONTRACTOR to follow COMPANY GI-1259.

1.1.8 CONTRACTOR shall comply with GI-2219 for Utilities hoses and connection and ensure hoses they bring on site are inspected and meet COMPANY Standards. The condition of hoses shall be stated on the inspection report with hydrotest report from Third party and inspection reports must accompany the CONTRACTOR when they arrive at site and shall be immediately available for review by COMPANY representative.

1.1.9 CONTRACTOR shall ensure all received hoses, manifolds, Hard piping, Connection are equipped with identification tag and supported with third party test certificate. (Anything found to be non-compliant shall not enter to our facility) for performing the mentioned SOW.

1.1.10 Arranging Breathing Apparatus sets, Air compressor, air Hoses, Cleaning Hoses, Lances, Standard Nozzles, Vacuum Truck Hoses, Calibrated Pressure Safety Device and Gauges etc. (Verified Breathing air cylinders contain Grade D air and are not filled via synthetic air blending)

1.1.11 CONTRACTOR shall comply with COMPANY's all General Instructions (GI) and Best Practices related to the scope of work. Copies of COMPANY General Instructions will be provided.

1.1.12 All tools, equipment, and resources are subject to initial and periodic inspection by COMPANY personnel to ensure safe and compliant use within the COMPANY facility. COMPANY reserves the right to reject use of any tool(s) or equipment for cause.

1.1.13 Define by craft and name all personnel required to execute and supervise the scope of work 45 days in advance of the T.A. start date as defined by COMPANY T.A. Management. CONTRACTOR will schedule personnel for required pre-T.A. training at the request and timing specified by COMPANY T.A. Management and COMPANY Safety Representative.

1.1.14 Providing necessary tools and qualified personals for performing the mentioned SOW.

1.1.15 Providing necessary consumable and expendable supplies in enough quality and quantity for personnel to perform the scope of work safely and efficiently.

1.1.16 Maintaining a job site that is always clean and free of debris. After completion of work, leave the area as clean as found.

1.1.17 CONTRACTOR daily work schedule will be two shifts of TWELVE (12) hours each. CONTRACTOR to ensure the shift turnover for critical and near critical path Equipment to be done at site.

1.1.18 Provide maintenance progress updates and Manpower count to planning during each shift.

1.1.19 Visiting the job site to acquaint themselves with existing conditions.

1.1.20 Any discovery work shall be invoiced separately and shall be based on COMPANY approved CMF (Change Management Form)

1.1.21 CONTRACTOR shall follow COMPANY Fatigue Policy CP # 1055. CONTRACTOR shall mobilize the personnel under their direction to comply with this policy to ensure personnel physical health without negatively affecting TA schedule or quality

1.1.22 CONTRACTOR to mobilize the right number of Equipment & Manpower to site as per agreement during bid clarifications queries supported with Equipment and Manpower loading chart

1.1.23 CONTRACTOR Equipment and Leadership team like Supervisors/Foremen/Leads, Lead Planner QA/QC, etc.as applicable shall comply to the COMPANY plan for early mobilization as specified for necessary preparation works. CONTRACTOR shall mobilize the before mentioned craft at least by Fifteen (15) days ahead of start of S/D start date unless approved by TA Planning Superintendent or TA Manager and communicated by contracts department

1.1.24 Providing qualified Permit Receivers, Cleaning Technicians, Supervisor / Foreman, BA operators / Technicians, Man hole watch, full time Safety personnel whose sole responsibility shall be to ensure CONTRACTOR personnel conduct work in accordance with Rules and Regulations of COMPANY, and that good safe work practices are always utilized.

1.1.25 Safety officer's final acceptance will be after face to face interview with COMPANY safety department.

1.1.26 Discarding all coke, sludge, damaged parts, packing / scrap metals, and all other general rubbish from maintenance activities into designated waste containers provided by COMPANY. The CONTRACTOR shall make arrangements to shift waste containers to temporary waste storage areas designated by COMPANY.

1.1.27 CONTRACTOR shall ensure presence of their personnel to the designated work area only. Any Person found in or around unrelated plant area, shall be subject to immediate removal from Plant. CONTRACTOR shall provide a suitable replacement immediately to avoid any effect on work progress.

1.2 **COMPANY:**

1.2.1 Office facilities for CONTRACTOR (as decided by COMPANY T/A management, either Blast Resistant Module for essential on-site personnel, or workspace in the T/A office for non-essential personnel)

1.2.2 Supply, Erection / Dismantling of all scaffolds and revisions as required by CONTRACTOR

1.2.3 Perform remove / reinstall insulation, as required.

1.2.4 Tent with tables and chairs for CONTRACTOR lunch and rest break. Drinking water around the clock.

1.2.5 Prayer facilities, Rest Shelters, Smoke Shelters in designated work locations.

1.2.6 All temporary lighting for confined space entry (required by GI, Class-1 Div-1)

1.2.7 All EHS meters and monitors will be provided by COMPANY

1.2.8 Sanitary facilities (toilets and hand wash stations)

1.2.9 All non-consumable material required to perform the scope of work

1.2.10 Inspection of work performed by CONTRACTOR.

1.2.11 Isolation of System and Perform blinding as per blind list.

1.2.12 Perform all required Gas Testing (testing of LEL, H2S, Benzene).

1.2.13 Provide diesel fuel (including on-site refueling).

1.2.14 Provide forklift and/or crane to set-up CONTRACTOR equipment and during mobilization and demobilization c/w operators, riggers and lifting slings and tackles.

1.2.15 Conduct BSO Course and required courses for Permit Receiver (as required).

1.2.16 Issuance of ID cards and Vehicle stickers.

1.2.17 Issuance of material gate passes and Work Permits.

2.0 DESCRIPTION OF WORK-SPECIFIC:

CONTRACOR's scope is included but necessarily may not be limited to:

2.1 To execute F-3301 and F-3201, Convection section Steam Super Heater Fin Tubes blasting and cleaning using Dry technique so as to avoid water getting into the fire box, which would damage the refractory lining.

CONTRACTOR shall supply all the required equipment and manpower, supervision to complete Scope of work.

2.2 CONTRACTOR has to furnish all field walkdown and necessary meetings with COMPANY Representative for any clarifications and submit procedure / method of statement for review and approval.

2.3 The purpose of the blasting and cleaning is to remove significant amount of refractory dust fouling convention section fin tubes / bundles of Furnace F-3201 and F-3301.

2.4 After award of contract, CONTRACTOR shall work with COMPANY Representative to develop detail procedures for entry and cleaning the Convention sections of F-3201 and F-3301, as well as the technical support as necessary to ensure a safe and successful Convection section dry blasting and cleaning.

2.5 Tentative work Schedule:

2.5.1 TA Shutdown Down commencement start date (tentatively) – 1st Jan' 2024 or 15th Jan' 2024. The Shutdown start date shall subject to change which will be informed to CONTRACTOR six (6months) before the Turnaround.

2.5.2 The Start Days is given below, CONTRACTOR should provide in Proposal the required duration required in days, working 12hours two shift and sequence of activities to evaluate and integrate with Furnace F-3201 and F-3301 Maintenance window.

S#	Equipment	Tentative Start Date	Remarks
1	F-3301	14.01.2024	Considering the Plant Shutdown on 01.01.2024
2	F-3201	16.01.2024	Considering the Plant Shutdown on 01.01.2024

2.5.3 However, CONTRACTOR shall follow the COMPANY level 3 firm schedule provided to CONTRACTOR for Turnaround.

3.0 DRAWINGS, SPECIFICATIONS & PROCEDURES

Specifications, standards, procedures, drawings and Company's General Instructions shall apply to Engineering and construction works when applicable. All above documents shall be collected from Turnaround Planning Section.

4.0 GUIDELINES

4.1 All work should follow COMPANY Standards and Specifications.

4.2 All work outside the above codes, standards and specifications shall follow COMPANY guidelines and practices.

4.3 CONTRACTOR shall comply with COMPANY Policies, General Instructions and Work Procedures regarding the use of Personal Protective Equipment's (PPE).

4.4 CONTRACTOR shall comply with COMPANY Safety and Security program Exhibit III (more details can be sought out later by CONTRACTOR as applicable)

4.5 COMPANY may from time to time and at any time require CONTRACTOR to suspend performance hereunder completely or partially for whatever length of time COMPANY may elect. The time for completion shall be extended by each period that the completion date is necessarily delayed by (a) the

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FURNACE CONVECTION SECTION CRYSTAL DUST CLEANING

SN	DESCRIPTION	DURATION	SCHEDULE		January-2024																					
		DAYS	START	END	3		4		5		6		7		8		9		10		11		12		13	
					D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
1	MOBILIZATION	1	3/1/2024	3/1/2024																						
2	TEMPORARY EQUIPMENT RIG UP	1	4/1/2024	4/1/2024																						
3	INSIDE FURNANCE CONVECTION SECTION ADDITIONAL SCAFFOLDING IF REQUIRED (BY S-CHEM)	2	3/1/2024	4/1/2024																						
4	INTERNAL PREPARATION	1	5/1/2024	5/1/2024																						
5	CRYSTAL DUST CLEANING OF FURNACE CONVECTION SECTION	6	5/1/2024	10/1/2024																						
6	AIR BLOWING INSIDE CONVECTION SECTION	1	11/1/2024	11/1/2024																						
7	DUST REMOVAL FROM INSIDE CONVECTION SECTION	1	11/1/2024	11/1/2024																						
8	INTERNAL CLEANING INSPECTION	1	12/1/2024	12/1/2024																						
8	TEMPORARY EQUIPMENT RIG DOWN	1	12/1/2024	12/1/2024																						
9	HOUSEKEEPING	1	13/1/2024	13/1/2024																						
10	DEMOBILIZATION	1	13/1/2024	13/1/2024																						
		11 DAYS	PARALLEL																							

SN	MANPOWER / EQUIPMENT	DAY	NIGHT
1	HELPER	6	6
2	BA TECHNICIAN	2	2
3	BLASTER	3	3
4	PERMIT RECEIVER	2	2
5	SUPERVISOR	2	2
6	SAFETY OFFICER	1	1
7	PROJECT ENGINEER	1	

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MAN POWER LOADING CHART

S.No	Description	Qty
1	Project Lead	1
2	Site Supervisor	4
3	Chemical cleaning foreman	2
4	Chemical Cleaning Technician	12
6	Helpers	12
7	Permit Receiver	4
8	Safety Officer	2
9	Manhole watch / Standby man	4
10	Fire watch	4
11	Dry Super Sucker operator	2
12	Drivers	2

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EQUIPMENT LOADING CHART

S.No	Item - Description	Qty
1	Air Compressor	3
2	After Cooler	2
3	Crystal Dust Machine	3
4	Air Moisturizer	2
5	Air movers	6
6	Crystal pallets	LOT
7	Toolbox	1
8	Dry Super Sucker	1
9	Hoses	LOT
10	SCBA **if required**	1

SAUDI CHEVRON PHILLIPS COMPANY
(SAUDI CHEVRON)

PREPARED BY BRIDGE SAUDI COMPANY LTD

CHEMICAL CLEANING & SPECIALIZED SERVICES

ISD PROJECT REF. No.: BRG/SD/MS-1240REV00

DOCUMENT TITLE:

OFFLINE CHEMICAL CLEANING OF QTY 02 FURNACE AT SAUDI CHEVRON PLANT USING CRYSTAL DUST® METHOD

ISSUED BY: – BRIDGE CHEMICAL CLEANING & SPECIALIZED SERVICES.

0.0	For Discussion	Bilal Shoaib	02.04.2023	Johnathon	02.04.2023				
Issue Rev. No	**Issue or Rev. Description**	**Origin by**	**Date**	**Check by**	**Date**	**Appr v'd. by**	**Date**	**Auth'd. by**	**Date**

1. ABSTRACT:

The prime objective is to identity fundamental requirements, specific design criteria and information consistent with the delivery of the critical safety and operating goals of the specialized Furnace Chemical Cleaning – External Cleaning of Qty. 02 Furnaces at SAUDI CHEVRON, Plant Al-Jubail.

This document presents the design and operation of equipment that addresses the issue of accessibility to the convection bank for proper cleaning. This is accomplished by using a **"CRYSTL DUST® Cleaning Technology"** that reaches deep between every row of finned or studded tube to remove the most tenacious fouling bringing the unit back to near new performance.

2. DEFINITIONS:

3.1. **Inert Gas**: A gas that is non-combustible and non-reactive.

3.2. **Hydrocarbon**: A chemical substance consisting of only Hydrogen and Carbon atoms.

3.3. **Flammable Liquid**: Liquid substances and preparations having flash point between 21° to 55°C. [European directive 67/548/ECC].

3.4. **Condensate**: Any material that has been condensed from the vapor state to the liquid state.

3.5. **Inerting**: A technique which a combustible mixture is rendered non-ignitable by adding an inert gas.

3.6. **Low Flammable Limit [LFL]**: That concentration of a combustible material in air below which ignition will not occur.

3.7. **Upper Flammable Limit [UFL]**: That concentration of a combustible material in air above which ignition will not occur.

3.8. **Breeching**: Section where flue gases are collected after the last convection coil for transmission to the stack or the outlet of the ductwork.

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3.9. **Bridge wall**: Division or Gravity wall separates two adjacent heater zones. Bridge wall temperature is the temperature leaving the radiant section.

3.10. **Furnace Bank Section**: The portion of the furnace in which the heat is transferred to the tubes primarily by convection.

3.11. **Corrosion Rate**: Reduction in the material thickness due to the chemical attack from the process fluid or flue gas or both, expressed in mils per year.

3.12. **Crossover**: Interconnecting piping between any two heater coil sections.

3.13. **Damper**: A device for introducing a variable resistance for regulating volumetric flow of gas or air.

3.14. **Coil Pressure Drop**: The difference between the coil inlet pressure and the coil outlet pressure between terminals, excluding the effect of static head.

3.15. **Thermal Efficiency**: The total heat absorbed divided by the total heat input expressed as a percentage.

3.16. **Header Box**: Internally insulated structural compartment, separated from the flue gas stream, which is used to enclose a number of headers or manifolds. Access is afforded by means of hinged doors or removal panels.

3.17. **Heat Absorption**: Total heat absorbed by the coils excluding any combustion air pre-heat, expressed in BTU.

3.18. **Radiant Section**: Portion of Furnace bank section, Primary Superheater, Secondary Superheater, Economizer in which heat is transferred to the tubes, primarily by radiation.

3.19. **Shield Section**: Contains those tubes that shield the remaining convection section tubes from direct radiation.

3.20. **Terminal:** Flanged or welded projection from the coil providing for inlet and outlet of fluids.

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3. SAFETY AND ENVIRONMENTAL PROTECTION:

During the execution of the work all safety measures will be followed as per SAUDI CHEVRON HSE policies, applicable methods, standards and procedures.

Before starting any cleaning operations, adequate measures for safety and protection of the environment shall be established.

All local regulations shall be complied with the client's requirements shall be observed.

The cleaning area shall be closed off to un-authorized personnel.

A "Stand-by" man should be provided while people are working inside the Furnace bank section, Primary Superheater, Secondary Superheater, Economizer.

Warning signs shall be posted to forbid smoking, welding, flame cutting and un-authorized entering of the cleaning area.

Where necessary, adequate drip pans shall be placed underneath the equipment to avoid soil contamination.

The cleaning media is bio-degradable in nature and does not present any risk to man or the environment. It does not require any special treatment.

Protective clothing shall be worn and other protective equipment, [Dust Coverall, face mask 3M Full Face Mask, special gloves] shall be used during cleaning and when handling cleaning agents. if required SCBA

An emergency shower with eye bath shall be available.

Proper grounding for our equipment and all individual flanges shall be done to avoid static electricity.

In the event the cleaning media goes inside the eyes, it will cause only mild irritation. No medical assistance is required just flush with copious amount of water.

4. GENERAL ENGINEERING INFORMATION:

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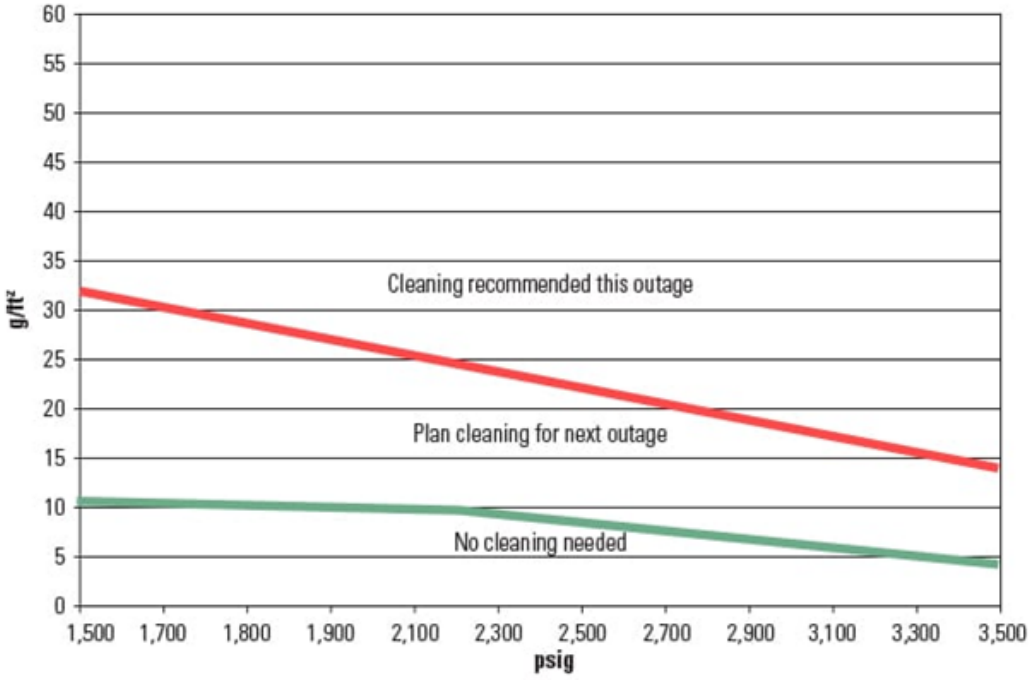
Regardless of the previous cleaning history of the Furnace Bank And Furnace Wall Tubes, at Saudi Chevron, they are prone to contaminate to some degree during operations. Therefore, it is necessary to clean by offline external chemical cleaning combined with **CRYSTAL DUST®** methods to give an acceptable standard of cleanliness.

There are multiple options to be considered when designing a chemical treatment program. Each project and each job present a different situation. It is necessary to select a specific series of treatment steps that will be most effective in each case to give a thorough and safe cleaning job. Each job site presents a unique situation regarding the basic services and utilities available. Also, the scale deposits and required cleanliness level vary in each case. The treatment program selected must be safe to use, and it must be compatible with the materials of construction of the equipment to be cleaned. Once these criteria are satisfied, the final selection between the suitable and available alternatives may be made, based on cost, disposal problems and time constraints.

Continuous monitoring of flue gas temperature leaving the Furnace Bank And Furnace Wall Tubes and the process cross-over temperature. As fouling occurs the flue gas temperature will rise, and the crossover temperature will fall. This will indicate a falloff in furnace efficiency and it also transfers more duty to the radiant section, causing higher metal temperature and shorter run lengths.



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As effectiveness of the convection bank drops, stack temperature increases leading to greater losses and greater energy consumption.

If the heater is operated for long periods without cleaning, it will seriously damage the mechanical components of the unit, including the life of the radiant tubes, tube supports and refractory materials.

5. SELECTION OF CLEANING METHODOLOGY: [OFF-LINE]

Simple cleaning was carried out by spraying chemicals onto the surface of the tubes, following with spray water. This was not very effective in particularly when the tube consists of several lines, the tube in the middle was almost impossible to clean.

In addition, the space between Furnace bank section, Primary Superheater, Secondary Superheater, tube bundles are too narrow to provide approach space for cleaning technicians, and the length of a convectional tube makes it difficult for workers to access there.

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To overcome these difficulties, we apply two steps of patented cleaning methodology:

- ✓ Firstly, using portable Heavy-Duty Vacuum unit [Pneumatic operated 2500 l/m, airflow 590M3/h] to remove loose debris/soot at the lower portion.
- ✓ Second, to perform **CRYSTAL DUST® technology** clean the tube bundles.

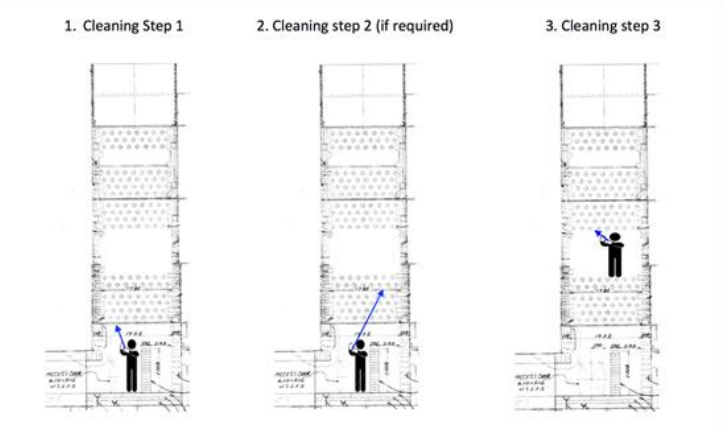
CRYSTAL DUST® is a specialized unique technique to clean the external finned or staggered tubes without using water media. We carefully chosen the combination of jet/air pressure and blasting medium therefore there will be no degradation of the base material and only the dirt will be completely removed. This will result in a neat and clean surface.

The Cleaning action is carried out by micro-particle collision, which causes both the cleaning media and fouling become pulverized.

The cleaning media is mildly abrasive so that is removes strongly bonded deposits from the fins [foreign particles, dirt's, ash and other deposits].

The air pressure is enough to force the cleaning media through all tube layers ensuring all are cleaned effectively, but not enough to damage the fins.

The micro-sized cleaning particles and fouling particles are lifted away from the unit by air currents with little fall down.



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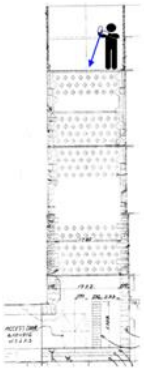
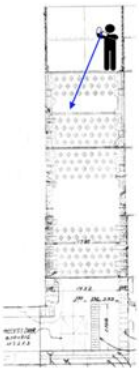
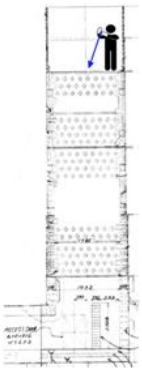
4. Cleaning step 4



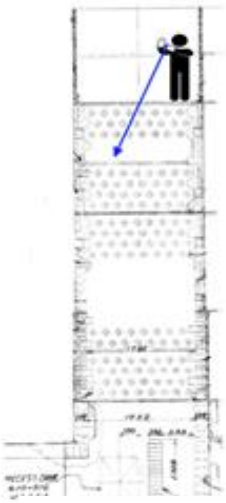
5. Cleaning step 5



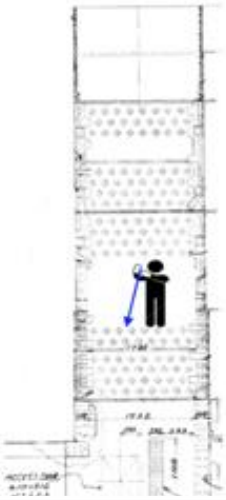
6. Blow-down step 1



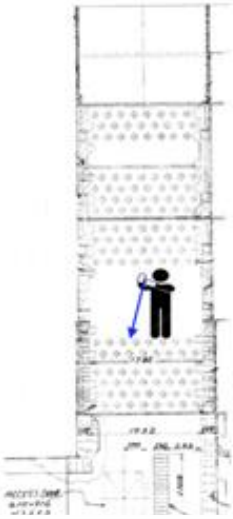
7. Blow-down step 2



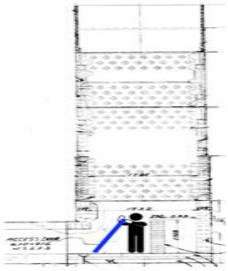
8. Cleaning step 6



9. Blow Down Step 3



10. Housekeeping



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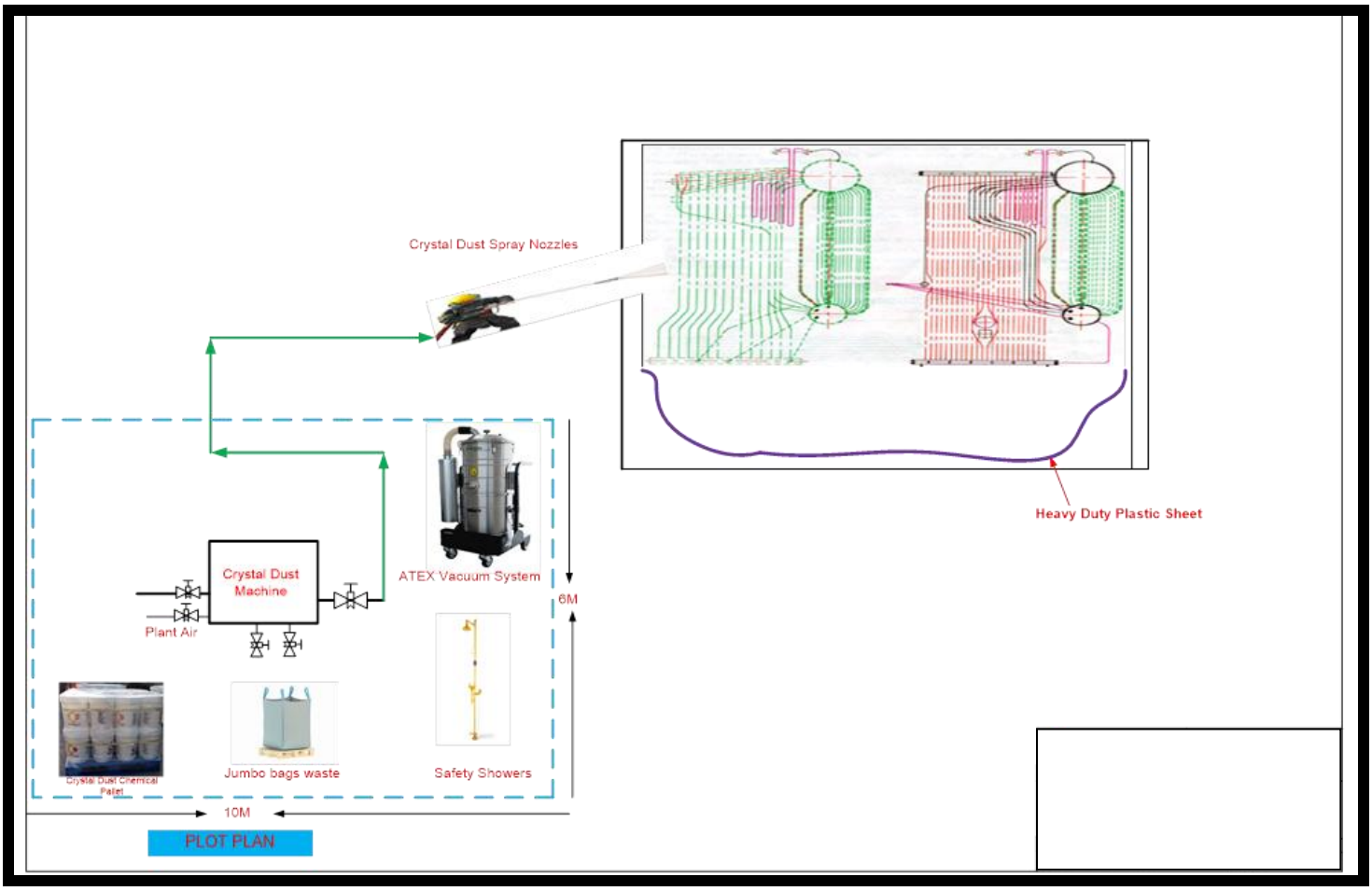

6. Scope of Work

6.1 Mobilization/demobilization from/to S-Chem

6.2 External tube cleaning of F3301 steam superheater convection coils using *Crystal Dust* technique

6.3 External tube cleaning of F3201 alkylaytor reboiler convection coils using *Crystal Dust* technique

7. Unit Descriptions

7.1 The F3201 convection section has a total of 9 tube rows, with 8 tubes per row, and a

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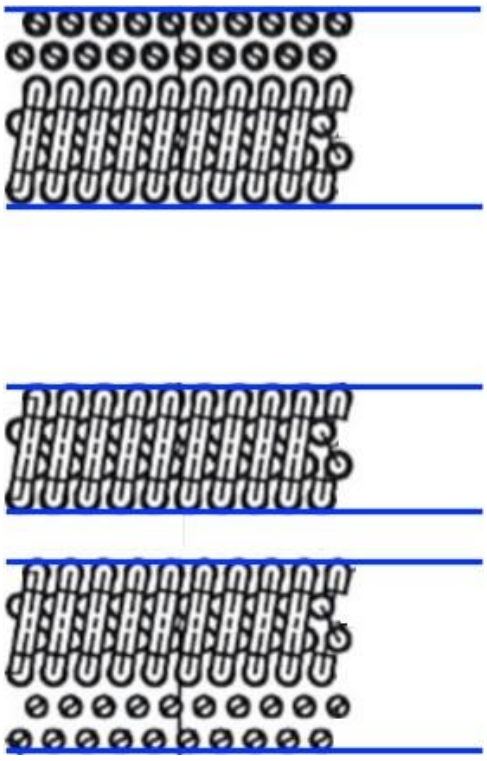
uniform tube length of 5.88 meters. The tubes are grouped into 2 separate banks witha void in between, which has a height of approximately 90cm. The elevation of bottom row of bare tubes is 23.9 meters, and the elevation of the top manway is approximately 29 meters. F3201 has a side access door allowing personnel to access.

7.2 The F3301 convection section has a total of 16 tube rows, with 10 tubes per row, anda uniform tube length of 18.29 meters. The tubes are grouped into 3 separate bundleswith voids (spaces) in between. The elevation of the bottom row of bare tubes is approximately 17 meters, and the elevation of the two top manways is approximately 23.5 meters. F3301 has no side manway, so personnel access is only from the upper manways and from below through the firebox.

7.3 The tube layout in F3301 can be illustrated in the following diagram:



Upper bank (height 1150 cm):6 rows of finned tubes

Void (height 120cm)

Middle bank (height 900 cm):4 rows of finned tubes

Void (height 50 cm)

Lower bank (height 1150 cm):4 rows of finned tubes
2 rows of bare tubes at bottom

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8. Explanation of Technique

8.1 Crystal Dust is a completely dry cleaning method that was specifically developed by our European partner TSOL for cleaning bundles of finned tubes.

8.2 The cleaning process is as follows:

8.2.1 Fluidized mineral crystals are injected by compressed air at 8 bar into furnace convection banks.

8.2.2 The crystal flows into all spaces, which means it flows around the complete circumference of tubes, as well as in between the fins.

8.2.3 An infinite number of impacts occur when the friable crystal impact finned tubes.

8.2.4 These collisions lift the fouling away from the tube and fin surface, and causes crystals and fouling to become pulverized.

8.2.5 The force of the compressed air pushes all crystal and fouling out the opposite side of the bundle.

9. Execution Overview

9.1 Equipment is positioned at the base of the furnace.

9.2 Hoses are lined up to the appropriate convection manway.

9.3 Cleaning operators wear single-line breathing apparatus and helmet torch.

9.4 Only one operator is inside the confined space during cleaning.

9.5 For F3301, we can only directly clean the upper and lower banks; the middle bank will be partially cleaned when cleaning the upper and lower banks.

9.6 To ensure F3301's middle bank is properly cleaned, an insertion nozzle is used.

9.7 In F3201, both banks can be cleaned from above and below, so there is no need to use insertion nozzles.

9.8 Pulverized fouling particles will be lifted up by the draft, and exit at the stack, whereas heavier particles will fall down.

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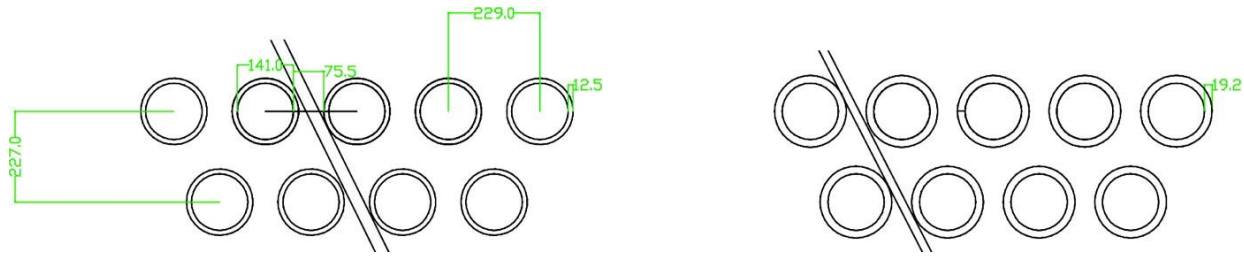
9.9 After cleaning, the convection banks are air blown and the radiant floor is vacuumed by a portable industrial vacuum unit.

10. Insertion Nozzle

10.1 To ensure the inaccessible middle bank is cleaned to the same standard as the lower and upper banks, we use a custom-designed insertion nozzle.

10.2 This nozzle is inserted through the upper and lower banks to deliver crystal at maximum pressure and at a wider spread so as to cover as much lateral distance as possible, thereby ensuring complete coverage.

10.3 By modelling F3301 tube layout, we have calculated the optimum nozzle size to fit between the upper and lower banks:



11. MAIN ADVANTAGES:

SAFE AND ENVIRONMENTALLY FRIENDLY

- No damage to metallurgy, fins, and refractory.
- Non-Hazardous, Non-toxic and bio-degradable formulation.
- Increase of Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater Efficiency and thus increase of throughput / production.
- Less down time and removes more debris from all layers of finned tubes.

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12. EQUIPMENT PROPOSED:

Our equipment proposed for the cleaning works shall be tabled below but not limited to:

No.	Description	Remarks
01	Air Compressor with hoses and accessories	Required Capacity
02	**CRYSTAL DUST®** Cleaning Units	As Required
03	Special hoses of various sizes	As Required
04	After Cooler	As Required
05	Special Nozzles / Lances of various sizes	As Required
06	Support Vehicles	As Required
07	20'-Office Container	01 Qty
08	Boom Truck	01 Qty
10	Lights – Explosion proof	As required
11	Special PPE	As required
12	Toolboxes	As required
13	Tarpaulins, wooden planks/reapers, HD PE Sheets	
14	NOR-CLEAN, HD Industrial Vacuum Cleaner unit	Pneumatic operated – 01 Qty

13. PERSONNEL PROPOSED:

All **BRIDGE** personnel are fully trained for Furnace Bank, Primary Superheater, Secondary Superheater, And Furnace Wall Tubes, Superheater, And Final Superheater. External Dry-Cleaning works. Crews are based on (24 hours) working for cleaning activity. The minimum PPE required are Steel Toed Boots, ANSI approved Hard Hat with chin straps, Nomex Coveralls, Full Sleeve high visibility shirt, Green waist jacket, gloves, hearing protection, Face shield with visor, Dust Coverall, 3M Full Face mask (mask filter type to be verified by Saudi Chevron EH&S) and safety glasses with side shields as per SAUDI CHEVRON recommended Standards.

14. REFRACTORY PROTECTION:

- Install the plastic sheeting on the floor of the radiant section to protect the burners etc. and on the floor of the convection section, and also locally to protect any areas of refractory.

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- Install the scaffold boards on top of the Furnace bank section, Primary Superheater, Secondary Superheater tubes to allow workmen to enter.

- Tie the Tarpaulins to the bottom row of the Furnace bank section, Primary Superheater, Secondary Superheater for support as necessary with temporary staging.

15. WORK TASKS:

- BRIDGE will mobilize to SAUDI CHEVRON Furnaces

- BRIDGE will supply and connect the site office, equipment, and consumables at the job site.

- Sequence and progression of work will be determined in initial planning meetings. Night shift work may not be required in the initial stages (during mechanical preparations) of the work. Continuous work (24 hrs. /day x 7 days/wk.) is required once cleaning work starts.

16. GENERAL PREPARATIONS:

16.1. BRIDGE will give a specific offline external chemical cleaning of external Furnace tubes (Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater) method statement to SAUDI CHEVRON for review and approval. SAUDI CHEVRON and BRIDGE personnel will meet for consultations as necessary to make any changes prior to beginning any external cleaning.

16.2. Any exceptions, later changes, &/or alterations to the offline external chemical cleaning method for each specific job will be noted and incorporated in this method statement.

16.3. The work area will always be barricaded with plastic tape & hard barrier, and relevant safety signs will be posted to inform workers in the area about cautions required due to the offline external chemical cleaning work in progress.

16.4. Work permits from SAUDI CHEVRON, plant will be required before commencing any job.

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16.5. SAUDI CHEVRON supplied pipe fitters will perform the necessary rigging & pipefitting to disconnect and remove manways, peep holes etc.

16.6. Protection equipment like wooden boards or light gage metal sheets, HD plastic sheets are placed.

16.7. Client to take care of internal scaffolding as per BRIDGE's site supervisor's advice.

16.8. BRIDGE will ensure that all sides refractory is perfectly covered and install the tarpaulin as a catch pit at the Bridge Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater section of Furnace.

17. CLEANING OPERATIONS:

All log sheets shall be kept as permanent plant records on completion of the cleaning operation. Copies of any contractor supplemental log sheets shall also be kept in the permanent plant records.

The contractor's shift supervisor will start a new log sheet when he comes on shift and will sign all log sheets filled out during his shift.

The contractor may maintain other supplemental log sheets, as he believes necessary.

18. CLEANING PROCEDURE - CRYSTAL DUST®:

Sequence of Cleaning shall be the following:

1. Furnace Water Wall
2. Primary / Secondary Super Heater
3. Furnace Bank Tubes
4. Economizer

(Please refer to our Typical Bart Chart for the Complete Duration of the Cleaning Sequence)

a. Mobilization of cleaning equipment to the unit location.

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b. After getting proper permits, Start Rig-up activities & perform the preparatory works as mentioned above.

c. Install the scaffold boards on top of the Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater section tubes to allow the technicians to enter.

d. The operation starts with a HD vacuum cleaning of soot and other loose debris using an Industrial HD pneumatic operated vacuum unit at the lower parts of the equipment.

e. Proceed with Refractory lining protection that also forms a "catch-pit" to collect the fall-off while cleaning operation in progress.

f. Bridge's trained technician start spraying clean dust media into the first bottom tube row by standing on the platform.

g. Air pressure shall be adjusted to a range of 04-06 bars.

h. The micro-sized dust media and fouling particles are lifted away from the units by air currents with little fall down.

i. The mechanical effect is non-aggressive abrasive action over the tube and fin surface to remove inorganic scale without damaging the surface or fins. It will remove strongly bonded deposits like scales, debris, oil grease, glues and rusts from the fins.

j. Cleaning action is carried out by micro-particles collision, which causes BOTH the cleaning media and fouling to become pulverized.

k. Air pressure should be regulated and monitored in such a way that cleaning media's force shall be enough to pass/penetrate through all tube layers ensuring all are cleaned effectively.

l. When all the visible air fins are clear of dust deposits, the bundles are considered clean.

m. Call for Visual Inspection by client.

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n. BRIDGE team finally cleans the work site and do a proper housekeeping.

o. Rig down and de-mobilize from site/location.

19. WASTE DISPOSAL [EFFLUENT]:

All Solid waste materials will be collected in the Steel Drums supplied by BRIDGE.

All solid waste shall be collected/shoveled in drums and labeled properly and transported to the government approved agency by BRIDGE.

Waste Manifest Sheet [WPS] shall be provided by M/s. SAUDI CHEVRON.

20. INSPECTION AND HAND-OVER:

It will be established that the Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater section been cleaned as per the approved procedure and inspections are done and ITP's signed by all parties involved.

It will be further established that the Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater shall be turn-over to the Operations for further control.

21. CONCLUSIONS:

It is of critical importance that the Furnace Bank, Primary Superheater, Secondary Superheater, Economizer, And Furnace Wall Tubes, Superheater, And Final Superheater are running optimally as even the lightest of fouling has a substantial impact on performance given the high proportion of operating costs made up large energy consumptions and heating requirements.

Traditional and often antiquated cleaning methods like [water spray, Dry Ice, or foam cleaning] are limited in their ability to remove fouling from finned or studded Furnace bank section, Primary Superheater, Secondary Superheater, Economizer.

Multistage Cleaning technology developed by BRIDGE offers a unique and superior solutions delivering proven energy and financial savings in situations where Furnace Bank,

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Primary Superheater, Secondary Superheater, Economizer, And Saudi Chevron Wall Tubes, Superheater, And Final Superheater cleaning methods have struggled or failed and at a superior net present value.

---------- **End of METHOD STATEMENT** ----------

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CRYSTAL CLEANING WORK EXPERIENCE

CLIENT	JOB TYPE	PROJECT NAME	CLIENT CONTACT NO.
SADARA	CRYSTAL DUST CLEANING	SADARA SGU BOILER CLEANING (GLOBAL CONTRACT) SUPERHEATER CRYSTAL CLEANING FURNACE SECTION CRYSTAL CLEANING ECONOMIZER SECTION CRYSTAL CLEANING FIN FAN CRYSTAL CLEANING	0133514055
SABIC/SAUDI KAYAN	CRYSTAL DUST CLEANING	OLEFINS CONVECTION SECTION FURNACE – 9 CLEANING – SAUDI KAYAN	0133563742
SABIC/SAUDI KAYAN	CRYSTAL DUST CLEANING	OLEFINS CONVECTION SECTION FURNACE – 4 CLEANING – SAUDI KAYAN	0133563742
SABIC/SAUDI KAYAN	CRYSTAL DUST CLEANING	OLEFINS CONVECTION SECTION FURNACE CLEANING - 2 – SAUDI KAYAN	0133563742
SIPCHEM	CRYSTAL DUST CLEANING	FINFAN CLEANING A-FRAME CLEANING	+96654644124
SASREF	CRYSTAL DUST CLEANING	FINFAN CLEANING USING CRYSTAL DUST	
SABIC/SHARQ	CRYSTAL DUST CLEANING	FINFAN CLEANING USING CRYSTAL DUST	+966551338545
JANA PETROCHEMICAL	CRYSTAL DUST CLEANING	BOILER CLEANING FINFAN CLEANING	+966508264444
GULF FARABI	CRYSTAL DUST CLEANING	FINFAN CLEANING FORCE DRAFT FAN CLEANING	+966501936596
IBN SINA (SABIC)	CRYSTAL DUST CLEANING	ONLINE MEOH FIN FAN CRYSTAL CLEANING	+966 (13) 340 5672
S-CHEVRON	CRYSTAL DUST CLEANING	FINFAN CRYSTAL CLEANING	
AMINAT	CRYSTAL DUST CLEANING	ONLINE FIN FAN CRYSTAL CLEANING	966 13 358 5100 Ext. 613

A SABIC Affiliate

كيان السعودية
saudi kayan

Certificate of Appreciation

Saudi Kayan Furnace Recovery Taskforce Team is pleased to present this certificate to:

M/s Bridge Saudi Company Ltd.

In recognition for distinguished contribution in Furnace #8 convection section chemical cleaning. Plant licensor (KBR) has considered this an outstanding achievement where Saudi Kayan's cracker is set to be the reference as the first SC-1 SCORE technology to successfully utilize Crystal Dust Spraying methodology, Resulting in 100 % recovery of Furnace 8 Capacity, 30° C reduction in flue gas temperature and gain 1.3 MBD production opportunity per Furnace.

05 NOV 2020

Abdullah A Al-Harbi
Manager, Major Maintenance
Taskforce Team Execution Leader
Saudi Kayan

Saad A Thafeed 05 NOV 2020
Sr. Manager, SMD Dept.
Taskforce Team Overall Leader
Saudi Kayan

Sahara International Petrochemical Company
(Saudi Joint Stock Company)

سبكيم
Sipchem
EXCELLENCE everywhere

شركة الصحراء العالمية للبتروكيماويات
(شركة مساهمة سعودية)

CERTIFICATE OF APPRECIATION

Awarded to:

BRIDGE SAUDI CO. LTD.

In honor of outstanding support & excellent offer during the external crystal cleaning for E-21002 A/B/C in July 2021

Abdulaziz M Al-Misfir
Mechanical Supervisor

March 29, 2022
DATE

ابن سينا
ibn sina

CERTIFICATE OF APPRECIATION

Ibn Sina is pleased to present this certificate to:

BRIDGE SAUDI COMPANY
AL JUBAIL, SAUDI ARABIA

IBNSINA Management would like to express thanks and appreciation, for your dedication of work efforts and safety performance for MEoH FIN FAN cleaning, during April – May 2022

15/05/22 14/Aug

ABDULLAH AL SHIBAN
Engineer, Planning
CMD- Central planning

May, 2022

A SABIC and CTE Petrochemicals Company Joint Venture

BRIDGE SAUDI COMPANT LTD

Document No: QA & QC /BSC/PRD REV.

Prepared to comply with the requirement of standard

ISO 9001:2015 and ISO 45001:2018., ISO-14001:2020

DOCUMENT TITLE:

QUALITY ASSURANCE/ QUALITY CONTROL PROGRAM

QA/QC DEPARTMENT:

NAME:

1) **VIJESH P.V**
2) **MOHAMMAD WASEEM**
3) **MOHAMMAD ASEEL MOOSA KOYA**

TABLE OF CONTENTS

- QUALITY MANAGEMENT SYSTEM
- QUALITY ASSURANCE PLAN
- PLAN OBEJECTIVE
- QUALITY CONTROL PROGRAM
- QUALITY CONTROL PERSONNEL AUTHORITY
- RESPONSIBILITY OF THE QC PERSONNEL
- QC MEETINGS
- INTERFACING WITH OTHER COMPANY DEPARTMENTS
- MATERIAL & SUB-CONTRACTOR APPROVAL
- CONTROLLI NG OF SHOP DRAWING & MATERIAL SUBMITTALS
- FI ELD & OFF SITE QUALI TY CONTROL PROGRAM
- OFF-SITE QUALITY CONTROL PLAN
- QUALITY CONTROL PLAN
- ORGANIZATIONAL CHART
- NON - CONFORMANCE REPORT FOR
- MATERIAL SUBMITTAL FORM
- REQUEST FOR MATERIAL INSPECTION FOR
- REQUEST FOR INSTALLATION INSPECTI ON FORM
- QUALITY CONTROL INSPECTION REQUEST FORMS
- CHECK LIST

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QUALITY MANAGEMENT SYSTEM(QMS)

1. Purpose

The purpose of this procedure is to highlight the processes needed for the quality management system for continual improvement.

2. Scope

This International Standard specifies requirement for a quality management system where an organization.

- Need to demonstrate its ability to consistently provide product that meets customer and applicable statutory and regulatory requirements, and

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- Aims to enhance customer satisfaction through the effective applicable of the system, including processes for continual improvement of the system and assurance of conformity to customer and applicable statutory and regulatory requirements.

Responsibilities

Top management shall provide evidence of its commitment to the development and implementation of the quality management system and continually improving its effectiveness by

- communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements
- establishing the quality policy,
- ensuring that quality objectives are established,
- conducting management reviews, and
- ensuring the availability of resources

Setting Up a QMS

The adoption of a QMS needs to be a strategic decision of an organization, and is influenced byvarying needs, objectives, the products/services provided, the process es employed and the size and structure of the organization. A QMS must ensure that the products/services conform customer needs and expectations, and the objectives, of the organization. Issuesconsidered when setting up a QMS includes its:

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- Design
- Build
- Control
- Deployment
- Measurement
- Review
- Improvement

- **Reviews and Assessments**

A good QMS will not function or improve without adequate review and assessment. Review and Assessment are carried out to ensure that actual methods are adhering to the documented procedures, whilst system reviews shouldd be carried out systematically, to ensurethe system achieves the required Effect.There should be a schedule for carrying out reviews, with different activities possibly requiring different frequencies

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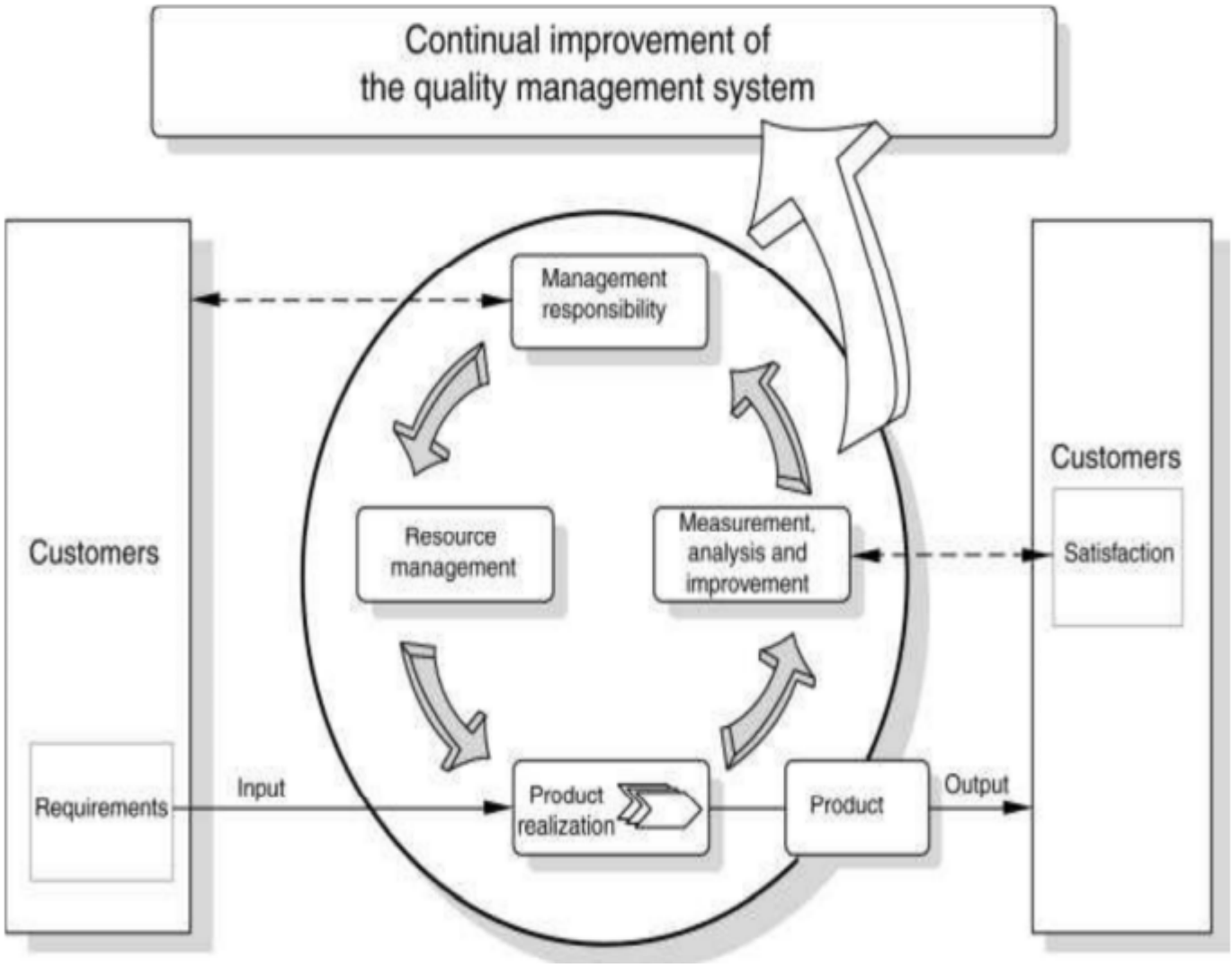
Flow Chart



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QUALITYASSURANCE/ QUALITY CONTROL PLAN

- **QUALITY ASSURANCE PLAN**

Plan Objectives

This Quality Assurance Plan is applicable to all the works to be performed in the Project. The program involves the strict adherence and implementation in compliance with the specification for all construction activities, which comprises of the following but not limited to:

- Field and off-site inspections (material & executed work);
- Field and off-site testing (material & executed works);
- Daily monitoring & inspection of field construction works;

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- Daily monitoring & inspection of field construction works;
- Daily monitoring & inspection of field construction works;
- Preparation of as-built drawing/O & M manuals by the end of the project;
- Internal Quality audits.
- Reporting to Client.

Quality Control Organization

The QC department will operate as a separate and independent section within the Project, report directly to the Project Manager its duty being to ensure conformance to applicable standards, specification and drawing with respect to materials, workmanship, construction, finish & functional performance, providing a state that assures the end product complies with specification.

Quality Control Personnel Authority

QC Personnel may at any time stop any work-in-progress not fully complying with the contract requirements. In stopping any sub contract work, a notice stating the reasons for rejecting will be issued. Work will not proceed until these unsatisfactory conditions have been rectified / corrected.

Full authority on behalf of TD to implement all aspect of the QC program including authority to reject non-complying work and order removal is vested to the Quality Control Personnel.

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Any deficiency will be corrected and the QC Manager shall be notified accordingly, before concealment of such work.

QC Personnel is authorized within his assigned areas of responsibility to approve/accept work that complies with the specification in coordination with CLIENT Representative.

Responsibility of the QC Manager

QC Manager

- Coordinate with Client regarding quality matters.
- Ensure all materials/equipment's received on site is inspected for compliance in accordance with Material Vendor Approval request (MVAR) approvals and are proper stored
- Ensure that all testing is performed as required under the technical provisions of the contract specifications.
- Maintain records of QC activities and make these records available at any time to Client's authorized representatives
- Enforce "Hold-Points"
- Deal directly with field supervisors to correct identified deficiencies and notify the QC inspector prior to concealment of corrected work

QC Inspector

- To assist the QC Manager in all QC activities
- To maintain filing & records system of all QC activities.

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- Conduct field and off-site inspection and testing as per specification and drawing.
- Conduct hold point release inspections.
- Ensure that all materials delivered on site are as per approved documents & standards.
- Conduct testing and commissioning inspection

QC Meetings

Each day, every member of the QC team will meet with the QC Manager, topic is to discuss progress and/or information. At the end of each day's work, each QC Inspector will submit a daily report. A bi-weekly QC meeting will be held which will enable the week's progress/problems to be discusses and also formulate the Weekly QC Report to the Client.

Materials and Sub-Contractor Approvals

The QC section will be responsible for evaluating all materials and goods specifications and approval prior to ordering thus determining their compliance with the Contract Specification prior to delivery on site. With QC visits to manufacturing plants and ocular inspection of site deliveries, it is assured that a material being used complies with the specifications. A Specification Comparison sheet shall be submitted from Client for approval prior to initiating procurement activities.

Sub-Contractors will be evaluated by the QC Section to assure TD that they are capable of providing the required materials, workmanship installed in manner acceptable to the client and within the contract Specification requirements. Pre-qualification data of Sub-Contractors' senior site personnel will be reviewed and get approval from Client.

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Controlling of Shop Drawing & Material Submittals

- The QC section will be aware of shop drawings and shall ensure that all component parts meet with Contract Specifications and Drawings, as received from the Client for construction.
- QC material Engineer will be responsible for reviewing all material submittals in compliance with Contract Specifications and Drawings.
- The Quality Control section will be responsible for reviewing all Purchase Orders, issued to the Project of permanent construction materials and verifying that all necessary quality-related requirements are incorporated on said requisitions will be verified as being placed with Client-approved vendors.
- The Quality Control section shall implement a schedule of off-site inspections of approved manufacturers, to ensure products are made in accordance with required specifications and drawings.

Field and Off-site Inspection (material & executed work)

- Inspectors shall inspect all materials received on site and satisfy themselves that these materials are acceptable as per Contract Specifications and are comparable to the Purchase Order placed, handled, stored and installed, in a manner not detrimental to the quality of the products. Receiving inspection result shall be recorded. Material Inspection Report to be filed up.
- Inspectors shall be aware at all times of the progress of work on each individual plot, and shall carry out all necessary duties including "Hold-Point" imposition pending Client Inspection.
- Inspectors shall prepare a request for inspection for the following day and submit a copy to Client 24 hours prior to inspection time.

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- The QC section will be constantly aware of the stages of construction on each plot and prior to the start of new phases, ensure that all materials and/or equipment have been submitted and approved.

Definitions

"Witness Points":

Important steps in Manufacturing and/or testing whereby prior agreement, the supplier is obliged to advise Contractors inspection personnel a reasonable time in advance of the operations as that it may be witnessed by Client inspector. The supplier may proceed with the work past the witness point if the inspector is not available at the appointment. In the event the inspector cannot witness the first occurrence of a particular operation, a subsequent occurrence shall be witnessed at the opportunity

"Hold Points": Critical steps in manufacturing and/or testing hereby contract document requirements, the supplier is obliged to advised Contractor's inspection personnel a reasonable time in advance of the operation so that it may be witnessed by the inspector. The supplier may not proceed the work beyond the hold point without witness by the Contractor's Client inspector.

Off-Site Quality Control Plan

Intention of Plan

The Quality Control section will arrange any necessary correction to a non-conformance item and coordinate all matters related to Off-Site Quality Control.

Inspection and Testing of Procured Items

At all times access for Page 16 of 42 inspections by the Client will be provided by arrangement with the relevant Manufacturer/Supplier.

Quality Control Procurement Monitoring System

Materials and equipment to be procured from Suppliers and/or Manufacturer's both within and outside the Kingdom will be subject to an Off-Site Inspection and Testing

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Plan for quality control monitoring. The Suppliers and Manufacturer will be informed of the required procedures contained in the plan to ensure a smooth, orderly and high quality end result.

Inspection and Testing Procedures for Major items to be Procured

Inspection Reports

To cover in process and final assembly inspections of each major item, inspection reports shall be prepared providing information required there on. These will also show date, inspector, type of observation results, acceptability and action taken to correct deficiencies and documentation.

Definitions

"Witness Points": Important steps in Manufacturing and/or testing whereby prior agreement, the supplier is obliged to advise Contractors inspection personnel a reasonable time in advance of the operations as that it may be witnessed by inspector. The supplier may proceed with the work past the witness point if the inspector is not available at the appointment. In the event the inspector cannot witness the first occurrence of a particular operation, a subsequent occurrence shall be witnessed at the opportunity.

"Hold Points": Critical steps in manufacturing and/or testing hereby contract document requirements, the supplier is obliged to advised Contractor's inspection personnel a reasonable time in advance of the operation so that it may be witnessed by the inspector. The supplier may not proceed the work beyond the hold point without witness by the Contractor's inspector, for extreme conditions presented by written agreement from client.

Inspection of Procured Items upon Receipt at the Site

Upon receipt of purchase items at the site, they shall immediately be checked for quantity and dimension and a visual inspection carried out for finish and in conformity with the specification. The delivered materials shall be checked against

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copies of the original procurement documents and any discrepancy, breakage, loss or damage shall immediately report to the Procurement and Expediting Manager.

Inspection shall be carried out by the responsible Store man with assistance in cases of technical complexity by Quality Control Technicians/Inspectors.

Access shall be provided to the client at all reasonable times to verify deliveries.

Copies of inspection reports on produced items received at the site are to be retained at the Contractor's site office.

QUALITY CONTROL PLAN FOR THE FOLLOWING

CONTROL OF DOCUMENTS

Whenever there is a change or revisions of documents such as procedures. Instruction, the old documents will be removed from the file & discarded. The new or revised documents will take the place of the old documents. Old copies of the documents will be retrieved from the concerned personnel & replaced by the revised documents. All concerned personnel will be advised of the change and will be issued a copy of the new revised document.

CONTROL OF DRAWINGS

Any changes in the drawing will be marked-up in the preliminary As Built drawings. (As in technical query)

All concerned personnel will be notified about the changes.

All old drawings will be retrieved and replaced with the revised drawing, all concerned personnel, site workers will be issued a copy of the revised drawing

A log showing the status of drawings will be established to ensure that all drawings being used are of the latest revisions.

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MATERIAL IDENTIFICATION

All materials in the bulk will be stored in the TD general warehouse. A Quality Controller representative checks the delivery of the material. A delivery note will be compared with the requisition note ensuring that the material is the correct material. The QC representative also checks the tags, labels. Stencils & other markings for the traceability of the material. These materials will then be stocked in the warehouse in an orderly manner

RECORD CONTROL

All quality control documents will be filed in a cabinet. Each file has labels to show the contents and to ensure easiness in picking which file is needed. Each file is also labeled by discipline. All quality control records are open for verification of personnel concerned.

PRE – INSTALLATION QUALITY CONTROL

Prior to start of any activity, a meeting of all disciplines is held. Discussions on how to attack the work will be the topic. Also discussed in this meeting are problems to be met by other disciplines with relation to the activity, and how to avoid, correct such problems in the future by other incoming works. Coordination between the other disciplines is very important. Prior to start of work preparations such as cleaning of substrate, availability of materials and other pertinent matters will be inspected by QC personnel. If satisfied a request of inspection will be issued 24hrs before start of work. A hold point inspection will be signed by the client representative thus approving the start of the work

CONTROL OF MOCK-UP COSNTRUCTION

Approval of mock-up must have a prior approval from the client before starting of work. And make sure that there is always an available procedure for the construction of mock-up before starting the installation of work requiring mock-up.

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INSTALLATION QUALITY CONTROL

QC department will check all materials, drawings, procedures & other relevant matters regarding the installation. Routine inspection of ongoing work to be done by the QC department. Correct any deviations found out during surveillance of the work. Seek advice. Clarification from the client's representative if any doubt occurs. Upon completion of work & being satisfied issue request for inspection. Protect completed installation from any damages.

MANUFACTURER'S FIELD SERVICES

In case a manufacturer rendered a field services like providing a field quality control, there must be a specific requirements that is clearly outlined for the implementation of the services such as observing the site conditions, the condition for surfaces & installation, quality of workmanship, or supervision of the work installation, application of the products, commissioning start-up, & demonstration

INSTALLATION INSPECTION &TESTING

The contractor shall have inspection & test plan approved by the client indicating in details the methods & timing for testing. measurements to assure compliance with the contact requirements

Inspection & test plans shall have provisions for ensuring and recording that prerequisites for any given test have been met.

The process for inspection, testing, & documentation shall abide the requirements of the technical specification, drawing, & supplier data as part of the attachment. Included herein are the following:

- Construction for inspection.
- Inspection acceptance criteria
- How and when inspection are to be done
- "Hold Points" documents include the description of work to be inspected appropriate Pay item reference

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- This hold point should be made by the contractor requiring the signature of contractors QC manager as well as the signature of client field engineer
- The contractor should advice client a written notice 24 hrs prior to inspection of the work.
- Any activities shall not proceed beyond any "hold point" until the client has inspected the particular activity
- This documentation shall be recorded or made in the "Daily Quality Control Report"

- **Quality Management Audit Procedure:**

  The Quality Management Audit Procedure section discusses the different procedures as they relate to the five different types of audits. The five different types of audits are; designer audit (with or without notice), project audit (with or without notice), and special circumstance audit

- **Program Management Office (PMO)** - The NJDOT service area that is responsible for performing Quality Management Audits

- **INTERNAL QUALITY AUDIT**
  Internal quality audit can be divided into six different categories as listed below:

  - Quality system audit
  - Management quality audits
  - Process quality audits,
  - Data processing quality audits
  - Product quality audit
  - Decision sampling audit

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- **EXTERNAL QUALITY AUDIT**

External quality audits are conducted by auditors who are not members of the auditee's organisation. Auditors who perform external quality audit are specialists from outside the organisation hired to conduct an independent audit.

- Quality system certification
- Vendor appraisal
- Regulatory controls
- Quality system improvement audit
- Product certification.

METHOD STATEMENTS

1) The Contractor will establish fabrication process and work procedures and controls before starting any activity to ensure that the work process comply with the requirements of the contract specifications and drawing.

2) The contractor shall maintain a copy of all documents of all method statements, including special process procedures at the site office or at the fabrication yard in reference to the drawing and specifications including the inspection procedures of the materials

CONTROL OF INSPECTION, MEASURING AND TEST EQUIPMENT

The frequency of inspection, measuring and test will be as per project requirements. Additional inspection or testing will be done if deem needed. Only specific equipment's will be use in their intended use. Before any testing, measuring QC department will see to it that calibration of the equipment is valid. Tags or label should be visible on the equipment to be used. Calibration of equipment to be done every 6 months. Serial number, date of last calibration of equipment, and date of the next calibration should appear in the tag, label. Calibration to be done by certified

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independent body. A record showing the necessary information's regarding the calibration of equipment will be available in the work site. Validity of test results done with equipment that is out of calibration will be monitored and documented. All testing's will be done by all independent testing laboratory approved by the Client

ORGANIZATIONAL CHART

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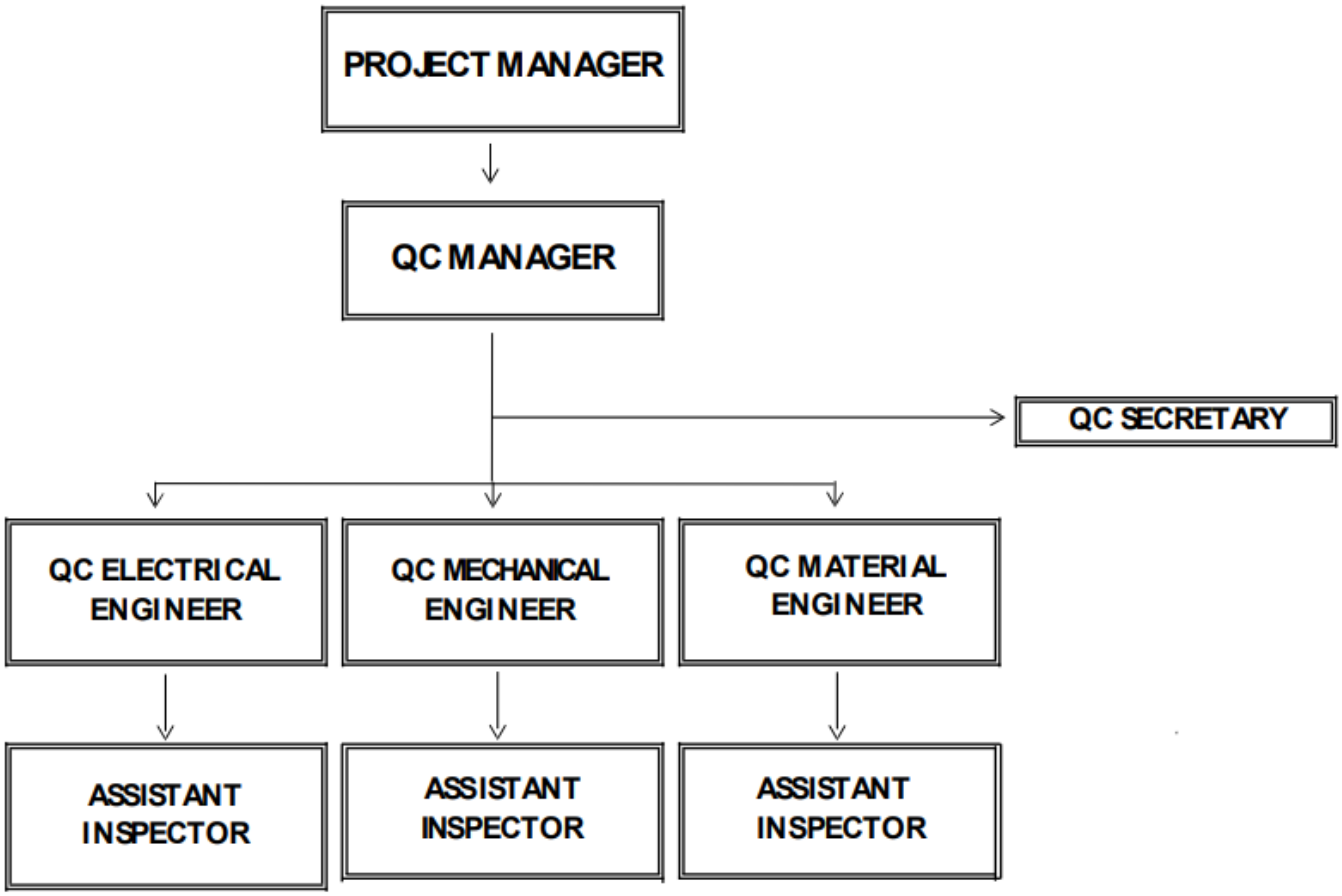
QUALI TY CONTROL ORGANI ZATI ONAL CH ART



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- **NON-CONFORMANCE REPORT FORM**
- **MATERIAL SUBMITTAL FORM**
- **REQUEST FOR MATERIAL INSPECTION FORM**
- **REQUEST FOR INSTALLATION INSPECTION FORM**
- **QUALITY CONTROL INSPECTION REPORT FORMS**
- **QUALITY CONTROL WEEKLY INSPECTION REPORT**
- **CHECK LIST**
- **CHECKLIST PIPE INSTALLATION**

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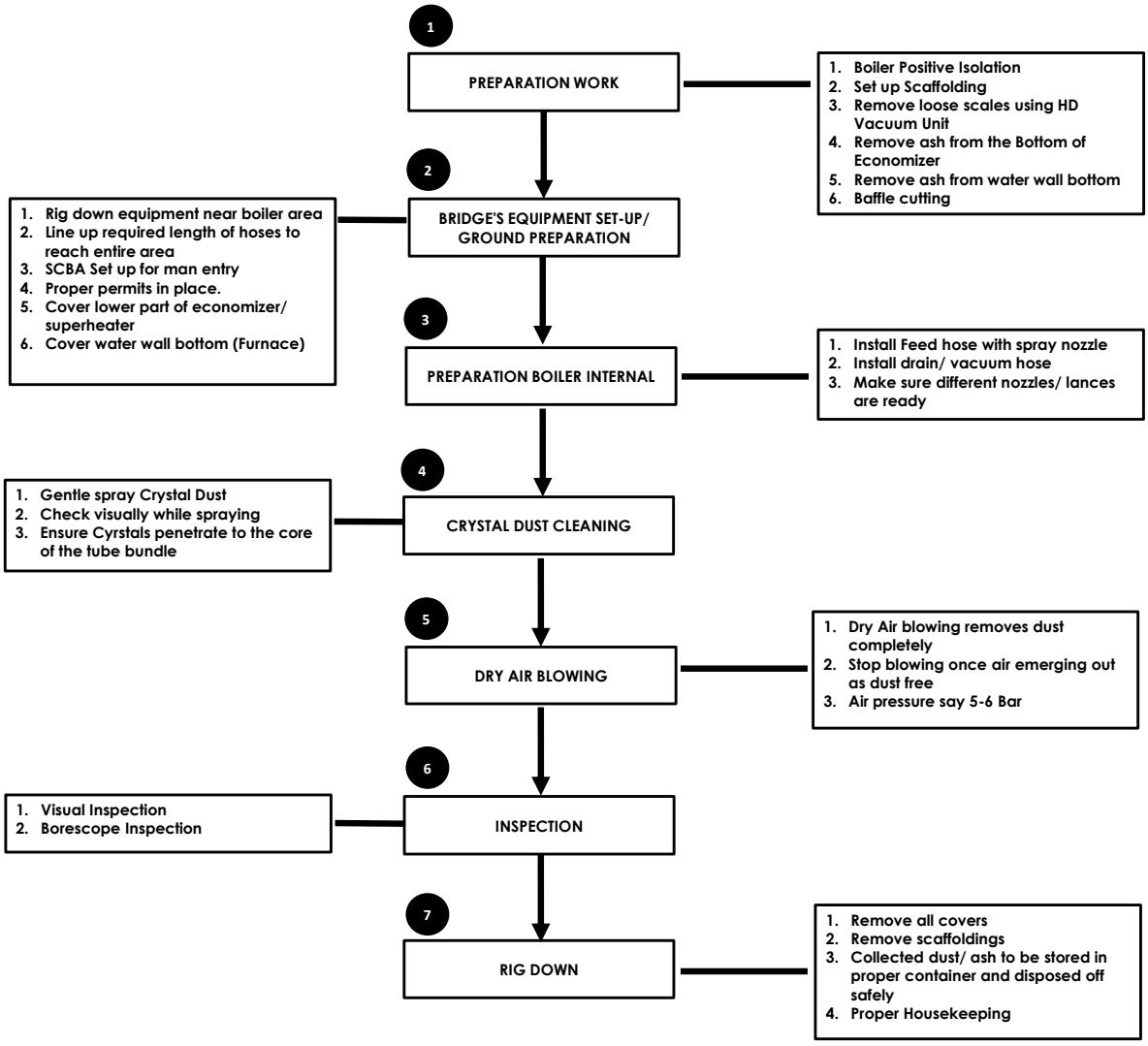
PROCESS FLOW PATH

CRYSTAL DUST - BOILER EXTERNAL CLEANING


1
PREPARATION WORK
1. Boiler Positive Isolation
2. Set up Scaffolding
3. Remove loose scales using HD Vacuum Unit
4. Remove ash from the Bottom of Economizer
5. Remove ash from water wall bottom
6. Baffle cutting
2
BRIDGE'S EQUIPMENT SET-UP/ GROUND PREPARATION
1. Rig down equipment near boiler area
2. Line up required length of hoses to reach entire area
3. SCBA Set up for man entry
4. Proper permits in place.
5. Cover lower part of economizer/ superheater
6. Cover water wall bottom (Furnace)
3
PREPARATION BOILER INTERNAL
1. Install Feed hose with spray nozzle
2. Install drain/ vacuum hose
3. Make sure different nozzles/ lances are ready
4
CRYSTAL DUST CLEANING
1. Gentle spray Crystal Dust
2. Check visually while spraying
3. Ensure Cyrstals penetrate to the core of the tube bundle
5
DRY AIR BLOWING
1. Dry Air blowing removes dust completely
2. Stop blowing once air emerging out as dust free
3. Air pressure say 5-6 Bar
6
INSPECTION
1. Visual Inspection
2. Borescope Inspection
7
RIG DOWN
1. Remove all covers
2. Remove scaffoldings
3. Collected dust/ ash to be stored in proper container and disposed off safely
4. Proper Housekeeping

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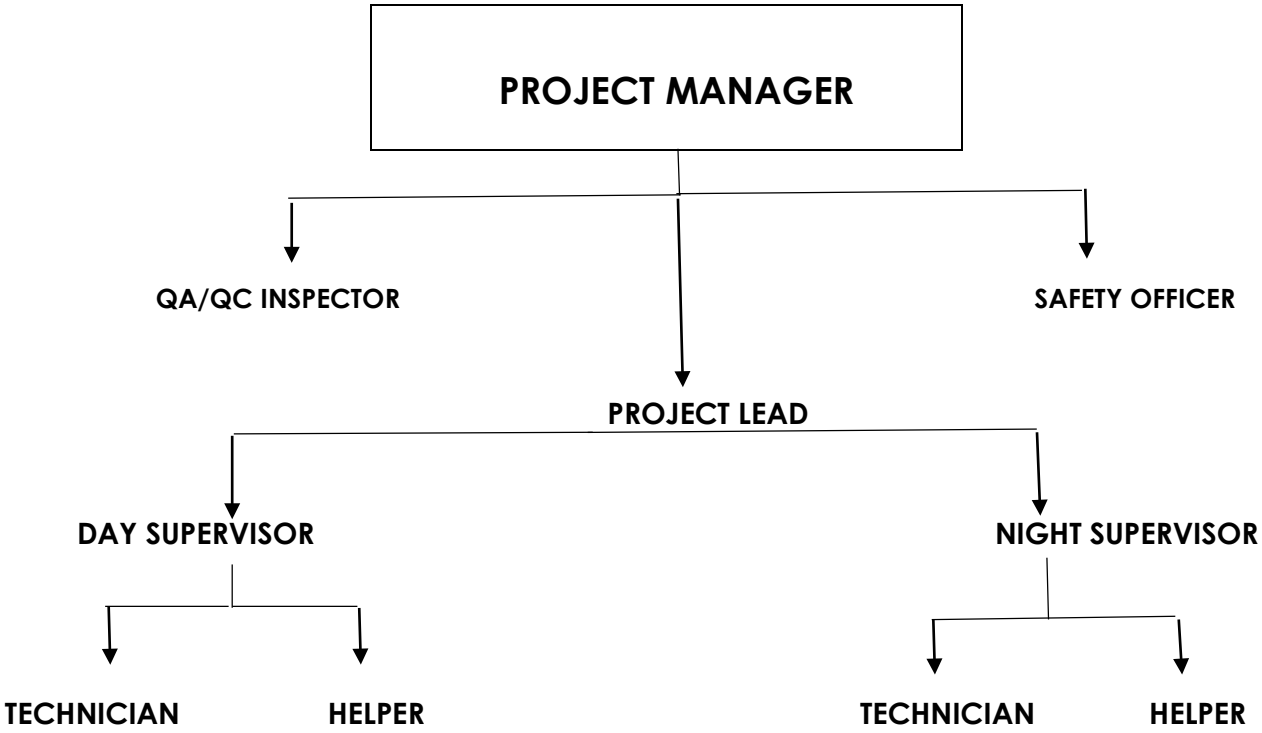
ORGANIZATION CHART



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SAFETY STATISTICS (LAST 03 YEARS)

Classification / Type	2019	2020	2021	Till June 2022
1.0 Personnel Incident / Injury Case				
1.1 On-job Fatality (FAT) case	0	0	0	0
1.2 Lost Time Injury (LTI) case	0	0	0	1
1.3 Medical Treatment Injury (MTI) case	0	0	0	1
1.4 First Aid Injury (FAI) case	1	1	3	2
1.5 Near Miss Incident (NMI) case	0	1	2	1
1.6 Recordable Incident (RI) case	0	2	1	2
1.7 Lost Time injury Rate	0.00	0.00	0.00	0.228571429
2.0 Property Damage / Vehicle Incident				
2.1 Fire Incident Case	0	0	0	0
2.2 Property Damage case	0	0	0	4
2.3 Motor Vehicle Accident (MVA)	0	0	0	1
2.4 Heavy Equipment Accident	0	0	0	0
2.5 Environmental Incident	4	18	33	39
3.0 Safety Toolbox Talks/ Training				
3.1 Number of Toolbox Talks Conducted	420	658	732	480
3.2 Number of Training Conducted	10	25	35	105
4.1 Total Man hours Worked	653100	699750	777500	525000

SUBCONTRACTING STATEMENT

We have not considered any Subcontractor for this Project as this is special services which is only Providing by Bridge Saudi Company, If there is any Subcontractor required Bridge Will take prior approval before commencement of work start from SAUDI CHEVRON.

for

شركة بريدج السعودية المحدودة
ESTIMATION
BRIDGE SAUDI COMPANY LTD.